

PRELIMINARY CLOSEOUT REPORT

NORTH MARKET STREET  
SPOKANE, WASHINGTON

SUPERFUND SITE

EPA REGION 10  
DECEMBER 2002

USEPA SF



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## **1.0 INTRODUCTION**

This Preliminary Closeout Report (PCOR) documents that Phillips Petroleum Company and Tosco Refining Company, the potentially liable person(s) (PLPs), under oversight of the Washington State Department of Ecology (Ecology), has completed the construction activities for the North Market Street Superfund Site located in Spokane, Washington. The State of Washington has determined that the final remedy has been constructed in general accordance with the North Market Street Cleanup Action Plan, which is equivalent to an EPA Record of Decision, dated December 1999, and the North Market Street Design dated January 2001. The implementation of the Cleanup Action Plan was conducted under the Model Toxics Control Act (MTCA) Chapter 70.105D RCW with Consent Decree 00207012-2 dated December 12, 2000, and no additional construction activities are anticipated.

## **2.0 SUMMARY OF SITE CONDITIONS**

### **Site Description and History**

The North Market Street Site (Site) is located in portions of Sections 15, 16, 21, 22, 27, and 28 Township 26 North, Range 46 East Willamette Meridian (WM), about one-mile north of the City of Spokane. Underlying the Site is the Spokane-Rathdrum Prairie Aquifer, which was designated as a "Sole Source Aquifer" in 1978 and provides the drinking water for approximately 400,000 people.

The Site is defined as the area of soil contamination and the groundwater contaminant plume. This definition includes the fuel terminal currently operated by Tosco (Facility) and the groundwater plume where contaminants above background have been detected. Petroleum hydrocarbons, benzene, toluene, ethylbenzene, and xylene (BTEX), polycyclic aromatic hydrocarbons (PAHs), and arsenic and manganese are the contaminants of concern at the Site.

Several of the properties which comprise the North Market Street Site were developed as industrial or commercial facilities that were involved in or related to the refinement, recycling, and sale of petroleum products. In the late 1930s, properties, including the current Tosco Spokane Terminal tank farm and distribution center, were developed as part of an oil refinery complex. Waste management practices common during that era resulted in releases of liquid refinery-related petroleum wastes into the environment.

Refinery operations were discontinued in 1953. The facility continued operations as a petroleum tank farm after refinery decommissioning. Today the Tosco Spokane Terminal continues to operate as a petroleum fuels storage and distribution center with an estimated cumulative capacity of approximately 391,500 barrels or 16,443,000 gallons, primarily automotive fuels. Since 1976 at least two major product spills have occurred at

the Tosco Terminal Facility. The Facility and properties that comprise the Site are primarily zoned for commercial and industrial purposes.

As early as 1978 local land owners and businesses located north of the present day Tosco tank terminal reported the presence of petroleum-laden soils on lands immediately north of the decommissioned oil refinery complex. In 1984 state officials confirmed the presence of petroleum contamination to groundwater from samples collected at three private water supply wells in the area. Use of those wells was discontinued and Ecology began supplying bottled water to users at that time. In 1991, the North Spokane Irrigation District No. 8 completed a 16-inch water line loop as far north as Magnesium Road to provide a potable water supply to users previously requiring alternate supplies.

In 1990 the US Environmental Protection Agency (EPA) listed the North Market Street Site on the federal Superfund National Priorities List (NPL) of hazardous waste sites requiring cleanup. After the Site was listed, Ecology assumed the lead to direct cleanup under the authority of the Model Toxics Control Act (MTCA) (Chapter 70.105D RCW).

### **PHASE I REMEDIAL INVESTIGATION FINDINGS**

The Phase I RI was completed in 1993. The investigative work resulted in: the installation of ten groundwater monitoring wells; an assessment of groundwater and soil quality; an evaluation of hydrogeologic conditions; a preliminary evaluation of soil conditions above the water table; and, an increased understanding of the extent and sources of groundwater contamination.

Results from the Phase I RI indicated that petroleum hydrocarbon contaminants were present in the Spokane Aquifer beneath the Site above the Washington State cleanup level of 1 part per million (ppm). In addition, BTEX, arsenic, and manganese were present above their cleanup levels. Soil contamination in the surface and near-surface was delineated and characterized at the Site. The contamination included petroleum hydrocarbons, BTEX, PAHs, and metals.

### **PHASE II REMEDIAL INVESTIGATION FINDINGS**

The Phase II program was developed to further characterize and define the soil and groundwater information. The Phase II program was conducted in 1995 and was comprised of: installation and sampling of nine additional monitoring wells and two borings to bedrock; installation and sampling of thirteen vapor probes; excavation and soil sampling of 89 test pits; and treatability testing of select soil samples.

The Phase II RI showed that petroleum hydrocarbon, PAH, BTEX, and metal contamination is present in Site near-surface soil (less than 15 feet); in deep soil to depths of 60 feet; and in soil at the water table (smear zone) about 150 to 170 feet below ground surface. Petroleum hydrocarbon and BTEX concentrations are also present in soil vapor

at depths of 50, 100 feet and below, and continue to be present in groundwater. Petroleum and BTEX chemicals in groundwater are detectable extending for about one-mile within the Spokane Regional Aquifer. The ground water flow direction beneath the site is north-northwest.

Maximum benzene concentrations were detected at 350 ppb, ethylbenzene at 200 ppb, xylene at 990 ppb, and toluene at 1,400 ppb. Gasoline and diesel range hydrocarbons were detected as high as 8 ppm and 13 ppm in ground water samples collected in 1995. Heavy oil range hydrocarbons were detected at 0.99 ppm in water samples. Free product was observed in five wells between 1995 and 1996.

The Phase I and II work is documented in a report titled Final-Draft Phase II Remedial Investigation Report – North Market Street Site, Spokane, Washington. June 1996. The Phase II RI Report presents a summation of previous investigations conducted at the site and the findings of the Phase II RI program.

#### **SUPPLEMENTAL REMEDIAL INVESTIGATION FINDINGS**

Additional RI work has been conducted at the Site since completion of the Phase II RI. The work began in July 1996 and consisted of installing five monitoring wells along with collecting two quarterly rounds of groundwater and soil vapor samples for analyses. Quarterly groundwater and vapor monitoring began again in May 1998 and has continued to present. Groundwater contamination continues to be present at the facility and beyond facility boundaries. Intermittent detections of free product have been observed during the quarterly monitoring.

In July 1998, four soil borings were drilled to the smear zone and the soil samples were collected for treatability testing. The sample testing indicated that microbes capable of biodegrading the petroleum hydrocarbon and BTEX contamination are present and a large reduction in contaminant mass is achievable.

#### **REMEDY SELECTION**

The feasibility study (FS) was finalized in June 1998. The selected alternatives in the FS included capping to address soil contamination and natural attenuation for groundwater contamination. After finalizing the FS, Ecology authors the cleanup action plan (CAP) for the Site. The CAP is the final decision document that selects the remedy for the Site. This document also sets cleanup levels for each contaminant in soil and groundwater and selects the cleanup actions to achieve these cleanup levels. Ecology's CAP is an equivalent document to EPA's record of Decision (ROD). The draft cleanup action plan (DCAP) was made available for a 30-day public comment period in December 1999. The comments were addressed in a responsiveness summary and the CAP was finalized in January 2000.

Following finalization of the CAP, Ecology initiated Consent Decree negotiations with the PLPs. After a 30-day public comment period, Ecology finalized the Consent Decree in November 2000. The Consent Decree is the administrative mechanism to implement the cleanup action plan (CAP) and provide a settlement of liability for the PLPs with the State of Washington. The Consent Decree was issued under the authority of the Model Toxics Control Act (MTCA), Chapter 70.105D RCW.

The cleanup action plan was designed to provide source control measures in the shallow soil contaminant mass and soil vapor in deep soil. The soil cleanup action for the shallow soil is excavation and thermal treatment of the excavated soil. The treated soil was returned to the excavation and compacted to 90 percent of maximum dry density. Field testing with a nuclear densiometer was used to confirm compaction. Bioventing was selected to address deep soil contamination by enhancing biodegradation in the subsurface. The treatability testing identified the presence of petroleum degrading bacteria and indicated that a large reduction in contaminant mass was probable with the addition of oxygen. A line of air sparging wells and coupled with natural attenuation was chosen as the cleanup action for the groundwater plume. The air sparging line is located about 1,400 feet downgradient of the fuel terminal in area where the groundwater plume contracts to about 300 feet laterally. Monitored natural attenuation was selected for the remediation downgradient of the sparge system.

Recent benzene concentrations range from 65 ppb at the fuel terminal in monitoring well NM-11 to 7.92 ppb in monitoring well NM-22, which is about 200 feet downgradient of the sparge line. The toluene levels vary in these wells from 6.3 ppb in NM-11 to 25.3 ppb in NM-22. The ethylbenzene and xylene concentrations in NM-11 range from 89.8 and 186 ppb to 39.3 and 26.9 ppb in NM-22, respectively. The gasoline concentrations in these wells range from 3.91 ppm in NM-11 to 2.5 ppm in NM-22 while the diesel concentrations vary from 1.08 ppm in NM-11 to 1.93 ppm in NM-22. The arsenic levels range from 24.1 to 19.7 ppm and the manganese concentrations go from 720 to 692 ppm.

The soil and groundwater cleanup levels set in the CAP were calculated to provide a total Site risk less than  $1 \times 10^{-5}$ . The soil cleanup levels are 6,000 ppm for total petroleum hydrocarbons (TPH), 0.5 ppm for benzene, and 1 ppm for total carcinogenic PAHs. The ethylbenzene and xylene cleanup level is 20 ppm while the toluene concentration is 40 ppm. The groundwater cleanup levels for TPH and benzene are 1,000 ppb and 5 ppb. The ethylbenzene and toluene cleanup concentrations are set at 30 and 40 ppb, while xylene is 20 ppb. Arsenic cleanup levels are set at 5 ppb and manganese concentrations are set at 50 ppb.

### **Remedial Construction Activities**

The shallow soil excavation and treatment, air sparging, and bioventing were conducted in general accordance with the Cleanup Action Plan, Washington State regulations, and the Model Toxics Control Act (MTCA) WAC 173-340.

The remedial activities were separated into individual tasks with the PLPs being responsible for the agreed upon tasks. Phillips Petroleum Company (Phillips) conducted the shallow soil excavation and thermal treatment task. Phillips' selected contractor Dust Coatings Inc. began mobilizing equipment on-site by July 12, 2001. A medium temperature thermal desorption unit was utilized to treat the contaminated soil. The thermal desorption unit (TDU) was operated between 950 to 1050 degrees Fahrenheit with a throughput of 25 to 40 tons per hour. The TDU is comprised of a two stage counter flow direct fired rotary desorber that uses a thermal oxidizer to treat the resulting vapor stream. The thermal oxidizer was operated between 1100 and 1200 degrees Fahrenheit and provided 99.9 percent destruction efficiencies.

Remedial construction activities were monitored and inspected by Dalton, Olmsted, & Fuglevand Consultants under direct contract to Phillips. Confirmation soil samples were collected from the excavation sidewalls and bottom on a fifty foot grid. Contamination was left in-place on the northern portion of the Tosco facility near the Chevron Pipeline due to setback requirements for the pipeline safety. Confirmation samples were also collected per 1,000 treated tons from the treated soil. The shallow soil remediation was completed in February 2002. A total of 81,910 tons of soil were treated and returned to the excavation. Representatives from Phillips, Dust Coatings Inc., Dalton, Olmsted, & Fuglevand Consultants, and Ecology completed a final inspection of the shallow excavation area in March 2002. A punch list was developed and addressed immediately prior to demobilization of the equipment.

Air sparging wells were drilled to depths of about 170 feet below ground surface (bgs) in September 2001. A total of ten sparge wells were completed perpendicular or across the groundwater flow direction (Figure 3). The wells were placed in two rows with approximately sixty (60) feet between each well. An alternating well placement was utilized in order to minimize stagnation zones between sparge points. The wells were constructed with five feet of two-inch diameter stainless steel well screen with a slot opening of 0.020 inches. The screen is flush threaded with two-inch diameter polyvinyl chloride (PVC) casing to ground surface.

The sparge wells are connected from the wellhead to the twenty horsepower, three-phase motor with one-inch schedule 80 PVC piping. The piping is routed through ball valves and flow meters, which allows for balancing the sparge system by providing similar flow volumes to each well. A 3/8-inch polyethylene tubing line is connected from the well head to a pressure gauge that provides the direct pressure readings of each sparge well. The system typically operates at a volume of 11-12 standard cubic feet per minute (scfm) with a pressure of about 5.5 to 7 pounds per square inch (psi) for each well.

Four monitoring wells were installed in conjunction with the sparge system. One well was installed upgradient with the other three downgradient of the sparge system. In addition, two existing monitoring wells, one upgradient and one downgradient are used to

monitor sparge system performance. The sparge wells began operating in August 2002. Prior to system start-up, groundwater samples were collected from these six monitoring wells to provide baseline data. Groundwater samples were collected two and four weeks after continuous system operation. Preliminary data suggests that the system is removing contaminants from the groundwater.

The bioventing wells were installed in December 2002. The wells are located in Areas 1 and 2, which is within fuel terminal property near the storage tanks (Figure 2). The thirteen wells were installed to depths ranging from 110 to 150 feet bgs. The bioventing wells are screened with 50 feet of 0.010-inch, 4 slots per inch PVC well screen. The screens are designed to mechanically limit flow so an even pressure distribution is realized along the screen length. A 120 foot radius of influence (ROI) was assumed for design purposes and was confirmed with pilot testing. The bioventing wells were installed with 200-foot grid spacing.

Two-inch PVC pipe connects each bioventing wellhead to the system. The system is comprised of a Rotron regenerative blower capable of producing 130 scfm with 30-inches of water column pressure. Pressure and flow volumes for each well are controlled individually with valves. The bioventing system is operated with a differential pressure gradient. This allows for the wells on the outside perimeter to be operated at a higher pressure, which will provide a flow gradient toward the heart of the vapor cloud and limit fugitive migration of vapors. Five vapor monitoring points were installed and added to the ten existing monitoring points that will be used to monitor the bioventing system performance.

MTCA requires that where cleanup levels are exceeded, a restrictive covenant must be placed with the deed. A restrictive covenant will be placed on the fuel terminal property as well as the affected landowners. The covenants will include the following restrictions: no withdrawal of water, maintenance of fences and locked gates, and no actions that may facilitate a release or create an exposure pathway. Institutional controls will be placed on the Site by January 2003.

### **3.0 DEMONSTRATION OF QA/QC FROM CLEANUP ACTIVITIES**

All sample collection activities at the site were conducted with Standard EPA methods and procedures. Standard QA/QC checks were incorporated by the laboratory in general accordance with the procedures required by the EPA contracts laboratory program (CLP). For parameters not covered under CLP, standard EPA methods were used.

Ecology found that the QA/QC program utilized throughout the RI was sufficiently rigorous and was adequately compiled to enable Ecology to determine that the analytical results reported are accurate to the degree needed to assure satisfactory data collection.

### **4.0 ACTIVITIES AND SCHEDULE FOR SITE COMPLETION**

No additional construction activities are anticipated to take place at the Site.

ACTIVITY	DATE
Institutional Controls	January, 2003
Cleanup Levels Achieved	August, 2032
Final Closeout Report	January, 2032
Periodic Review under MTCA	September, 2007
Compliance Monitoring	Ongoing until at least August 2032
Operations & Maintenance Activities	Ongoing until at least August 2032
Notice of Intent to Delete	January, 2032
Deletion Notice	February, 2032

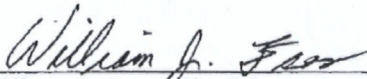
## 5.0 COMPLIANCE MONITORING

According to MTCA, compliance monitoring is required for all cleanup actions. Compliance monitoring shall take place at the Site to ensure that residual contaminants in site groundwater do not increase in concentration or occurrence. Compliance monitoring will continue under the current plan until groundwater cleanup levels are achieved in all Site wells. Adjustments may be made to the plan as Site conditions change. The monitoring will also be used to assess remedy selection performance. Water samples will be collected quarterly beginning in August 2002 and tested for BTEX, TPH, and select metals that are part of the post-closure monitoring program. Samples will be collected and analyzed using the same standard EPA methods as prior sampling, with similar techniques and QA/QC procedures. A five-year review of data will be performed in September 2007.

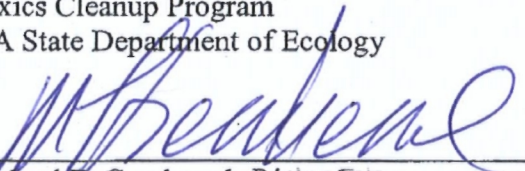
## 6.0 PERIODIC REVIEW UNDER MTCA

Periodic review of the cleanup action will be conducted no less frequently than every five years after the initiation of the cleanup action as specified in WAC 173-340-420. The purpose of these five-year reviews are to ensure that human health and the environment remain protective when hazardous substances remain on site as part of the remedial action. The Final Cleanup Action Plan has been implemented at the Site. Operations and maintenance (O&M) in accordance with the O&M Plan is required and will continue until the cleanup goals are reached. The O&M Plan will be completed by August 2003. The next periodic review will take place in December 2007.

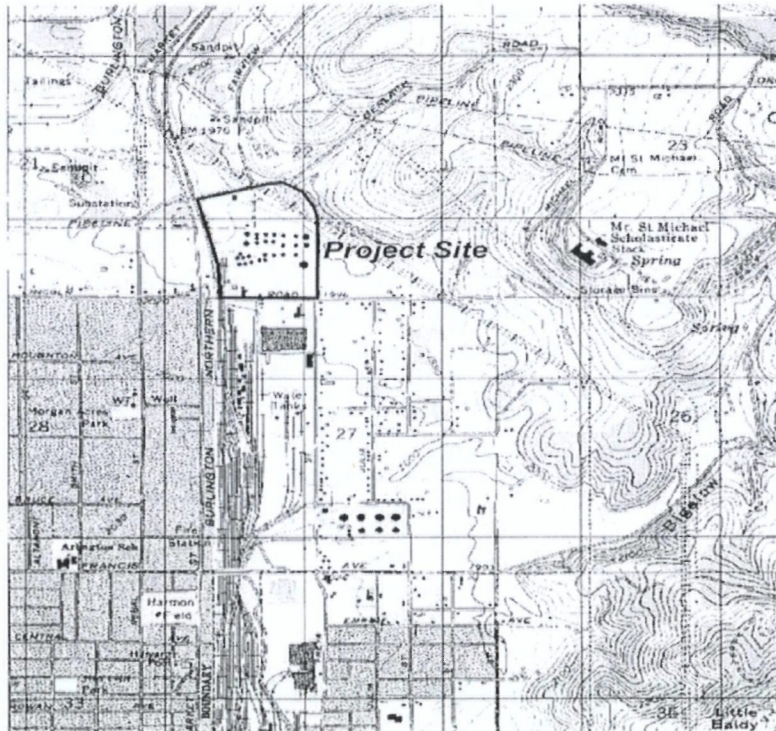


  
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William J. Fees, Site Manager  
Toxics Cleanup Program  
WA State Department of Ecology

12/24/02  
Date

  
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Michael F. Gearheard, Director  
Office of Environmental Cleanup  
US EPA Region X

12/30/02  
Date



Scale 1:24,000

Source: U.S. Geological Survey  
7.5 Minute Series Map  
Spokane Northeast Quadrangle  
1973 Photorevised in 1986

North Market Street Site  
Spokane, Washington

Vicinity Map

FIGURE 1

